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SOUTHERN FOREST EXPERIMENT STATION

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FOREST RESEARCH AND THE SOUTHERN LUMBER INDUSTRY

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The Occasional Papers of the Southern Forest Experiment Station present information on current southern forestry problems under investigation at the Station. In some cases, these contributions were first presented as addresses to a limited group of people, and as "occasional papers" they can reach a much wider audience. In other cases, they are summaries of investigations prepared especially to give a report of the progress made in a particular field of research. In any case, the statements herein contained should be considered subject to correction or modification as further data are obtained.

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## FOREST RESEARCH AND THE SOUTHERN LUMBER INDUSTRY\*

By E. L. Demmon,  
Director, Southern Forest Experiment Station

Permanent, successful, forest-land management must rest upon a sound foundation of knowledge—derived through forest research. In general, forest research must be fostered and advanced by public agencies, first, because it is inefficient for each landowner to undertake, alone, research for his individual land; secondly, because the public is by far the largest single owner of forest land; and finally, because in a long-time undertaking such as forest research, public agencies alone can be expected to provide the necessary stability of program. The responsibility of the Federal Government for forest research has been recognized in the establishment of 12 regional forest experiment stations throughout the United States.

The opportunities for forestry here in the South are not excelled in any other forested region of the United States. Here we have a vast area of exceptionally productive forest land supporting a variety of native trees valuable for many products; the climate and soils are favorable for rapid tree growth; we have relatively easy logging conditions, and are in close proximity to the world's greatest timber market. This forest is at present furnishing raw material for more than 10,000 industrial plants using forest products, and providing more than 50 million man-days' employment each year.

The foremost customers of forest research should be those owners and managers of forest lands who are interested in ascertaining the best forest management practices for their properties. In the South, those potential customers are primarily private landowners or their representatives, since about 93 percent of the region's forest land is in their hands. Of this immense area of privately owned southern forest land, it is estimated that somewhat over one-third is in farm woodlands, the remainder being in industrial and other holdings.

The Southern Forest Experiment Station serves the Lower South, a territory extending from Florida and Georgia to Texas and Oklahoma. There are approximately 122 million acres of forest land within these boundaries, representing about 60 percent of the total land area. Forest research at the Southern Forest Experiment Station was initiated on a small scale in 1921. Since then its program has been expanded gradually, and, within the limitations of funds available, it has sought answers to many of the problems of forest protection and management and of best forest-land use confronting this region. During this time, much has been learned about what constitutes good forestry practices, but forest research is necessarily a long-time undertaking. This is true even in a region of rapid tree growth such as the South, because the complexity of forest soils, forest types and conditions, the variety of forest products, and the multiple uses of forest lands result in so many problems demanding solutions. Because the most important forest problems in the Station territory have seemed to be concerned with timber growing in the pine region, practically all of the Station's limited funds thus far have gone into

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southern pine studies. This does not mean that the importance of the southern hardwoods has been overlooked, but rather that a choice was made as to where limited finances could yield the largest and most immediate benefits to the public.

The Southern Forest Experiment Station maintains its headquarters in New Orleans. Its main research activities, however, are centered on 9 experimental forests, representative of the major forest types, where investigations of the forest problems in those particular types are conducted. These experimental forests are publicly owned, and are usually adjacent to, or parts of, national forests. They serve as field laboratories for conducting fundamental and applied forest research and as demonstration areas where lumbermen and others can see, on the ground, the results of forestry practices. Since each of these centers of work is typical of forest conditions in its section, the results of these field investigations are applicable over wide areas and broad forest types. These experimental forests include the following:

NAME	LOCATION	HEADQUARTERS TOWN	AREA IN ACRES	FOREST TYPE	PRIMARY RESEARCH
Olustee	Osceola N. F.	Lake City, Fla.	2,961	Longleaf- slash	Naval Stores management
Hitchiti	Georgia Piedmont	Macon, Ga.	4,735	Shortleaf- loblolly	Forest management
Harrison (incl. McNeill)	DeSoto N. F.	Saucier, Miss.	3,850(Har.) 1,210(McN.)	Longleaf- slash	Silviculture
Chewalla	Holly Springs N. F.	Holly Springs, Miss.	2,500(est.)	Upland hardwoods	Forest influences
Delta	Mississippi Delta	Stoneville, Miss.	2,580	Bottomland hardwoods	Hardwood management
Palustris	Kisatchie N. F.	Alexandria, La.	4,100	Longleaf	Artificial foresta- tion & fire studies
San Jacinto	Sam Houston N. F.	Huntsville, Tex.	2,150	Shortleaf- loblolly	Pulpwood management
Crossett	Southern Ark.	Crossett, Ark.	1,686	Shortleaf- loblolly	Financial aspects of forestry
Irons Fork	Ouachita N. F.	Mena, Ark.	9,000(est.)	Shortleaf- hardwoods	Forest influences

The Southern Forest Experiment Station is organized in divisions, for which technical personnel are chosen on the basis of aptitude and training.

The men in the Division of Forest Management research concentrate upon studies of thinnings, improvement cuttings, naval stores operations, forest planting, forest soils, timber growth and yield, and forest fires, while specialists detailed from cooperating bureaus take care of forest diseases, problems of stain and decay, forest insects, and wildlife and game.

The staff assigned to Forest Economics covers several projects. These involve studies of: (1) the costs and returns from industrial operations and the possibilities of profits, for different objectives and for various forest types;

(2) the amount of and trends in taxation; (3) the feasibility (from the standpoint of sustained-yield forestry) of various forms of economic and financial organization; and (4) the forest survey. This latter group has cruised the entire Lower South, in units of from 5 to 10 million acres, and is reporting on stand, growth, drain and future market requirements, and land use.

The Division of Forest Influences staff is studying the effect of forests on water conservation, erosion, and streamflow, as a basis for determining sound watershed management practices. Flood control surveys are being made in cooperation with other bureaus of the Department of Agriculture, to determine flood damages and the extent to which land-use and other upstream control measures are feasible in retarding flood-flows and in preventing soil erosion.

The southern lumber industry is today in a state of transition. The day of exploitation based on liquidating virgin forest stands is about over. The forest survey tells us that less than 15 percent of the present forest area remains in old-growth timber. For the past several years, more than half the lumber produced in the South has come from second-growth stands, and that proportion will increase until in a few years all southern lumber will come from such stands. By and large, this second crop of timber has come up with very little care or attention. The beginnings of forest protection and forest management were made over 20 years ago by such pioneers as "Uncle Henry" Hardtner of Urania, and Col. Wm. H. Sullivan of Bogalusa, La., and rapid strides have been made in recent years in adopting conservative forest-management practices. Nevertheless, the recently completed forest survey shows clearly that southern forests are growing at less than 50 percent of their potential capacity, and that many stands are made up of widely spaced, fire-scarred, limby trees of poor quality and low value. This picture presents both a challenge and an opportunity. There is a big job ahead in rebuilding this great natural resource to its maximum usefulness. As this is accomplished, however, it will bring its reward in increased outlets for both capital and labor, to the benefit of the entire region.

I will now discuss some of the forest problems confronting owners of southern forest lands and relate briefly what the Southern Station is doing about them. One of the first essentials of a management plan for any forest property concerns harvesting practices—the operator needs to know when to cut and which trees should be removed and which left, to insure maximum growth and financial returns; which trees are needed as a source of seed; how open-grown stands can be brought to full capacity; how the more valuable species can be favored and the less valuable eliminated; when and to what extent young stands can be thinned or improvement cuttings made advantageously; when pruning can be justified, and how and when it should be done; and many other similar questions which must be answered for each of the many forest types, for many different sub-regions, and with several different objectives of management in mind. The Station does not have final answers to these questions, but it has made progress in obtaining solutions to all of them. Study plots, located chiefly on experimental forests, have yielded many preliminary results. The findings indicate strongly the benefits of conservative cutting practices, and in fact are now being used by a number of progressive forest owners.

For the shortleaf and loblolly pine types, frequent and light cuttings (known commonly as "selective cuttings"), judiciously applied, have been found feasible, and seem to promise maximum growth in quantity and quality. Actual case studies also indicate that stand-improvement cuttings can often be made



at an immediate profit. In many cases, worthless and undesirable hardwoods can be killed readily by girdling. Studies of pruning have also been started but have not progressed sufficiently to justify conclusions.

Volume and yield tables, giving the contents of trees of different sizes and potential rates of growth of second-growth, fully stocked stands of the four principal southern pines and of red gum, have been published. Closely related to growth rate is site quality, which is expressed as an index figure and represents potential soil productivity in terms of timber production. The Station is now preparing maps showing average forest productivity zones for the Lower South.

The specific requirements for obtaining adequate natural reproduction of the southern pines have been given considerable study by the Southern Station and broad general measures are now known. In brief, 2 to 4 well-distributed good seed trees per acre are ample to insure restocking of shortleaf, loblolly and slash pines, assuming, of course, proper protection from fire. Natural reproduction of longleaf is much more difficult to obtain than that of the other southern pines, because of the infrequency of longleaf seed crops, the need for optimum seedbed conditions, early competition with other plant growth, the brown-spot needle disease, and depredations of birds, rodents, and hogs. Four to six good longleaf seed trees per acre, well spaced, may be sufficient to obtain natural reproduction, but the factors of seedbed, disease, competition, etc., must also be properly controlled. Leaving a few scattered pine seed trees is merely a minimum measure to prevent forest devastation, and should not be considered a substitute for good forest management. While much additional information is needed before optimum silvicultural measures can be definitely recommended, the practice of at least these minimum requirements need not be delayed.

Estimates of the southern pine lands in need of forest planting exceed 20 million acres, depending upon the purpose to be served and the economic returns expected. This area includes more than 5 million acres of cut-over longleaf pine land so devoid of tree growth that no merchantable stand seems likely to reproduce naturally for many years. It includes in addition a great acreage of longleaf and other lands only partly stocked, on which planting is needed to bring the land promptly to economic productivity, and also a vast acreage of abandoned fields. Approximately 500,000 acres in the Lower South have already been planted to forest trees, with very general though not with complete success. The combined planting program of both public and private agencies includes the reforestation of between 75,000 and 100,000 acres of trees annually during the next few years, at a yearly cost in excess of half a million dollars. To date, Station studies have yielded many important facts fundamental to all phases of planting, but the continually expanding planting program continues to bring forth new problems that require much additional research.

An outstanding forest problem in the South, as in practically all forest regions, is protection from fire. In spite of the widespread publicity given to fire damage, the South continues to burn about 20 percent of its forest lands annually. This region has the unenviable distinction of having more than 75 percent of all the fires and more than 90 percent of all area burned in the United States. Only about half the South's forest land is under organized fire protection, and practically all this progress has been made in the last 20 years. Fortunately for the South, forest fires here do not cause damage comparable to that in other regions. Actually, fires have occurred rather frequently throughout



the South since earliest historical times, and forest areas that have never burned are exceedingly rare. Although southern forests are relatively resistant to the typical surface fires, in the aggregate a great amount of damage is incurred each year through destruction of tree seedlings, scarring of trees, and retardation of growth. On the other hand, fire, when properly controlled, may have beneficial effects for silvicultural and protection purposes under certain circumstances and in game and range management. Adequate control of fire, however, is a first essential to the practice of forestry in the South, and any use of fire must be technically sound and correctly adapted to the owner's purpose in managing the land. The Southern Station is studying: (1) the effects of fire, as a basis for making fire damage appraisals; (2) fire behavior and control, including an analysis of fire danger and the development of a fire-danger meter, to increase the efficiency of fire control organizations; and (3) the economical and effective use of fire in forest management.

A sound forestry program must be based on the management and utilization of our forest resources in the best interests of the individual, the community, and the nation. If our forests are to contribute their full quota of usefulness in terms of maximum income and employment on a stable, permanent basis, we need a sound foundation in forest economics. The Southern Station has made a start in obtaining this information in its studies of (1) the financial aspects of private forestry; (2) forest taxation and the cause and effects of widespread tax forfeiture; (3) the factors governing forest industry ownership in its policy of forest land management; and (4) the forest survey.

Information on the costs and returns of timber growing is essential in determining the all-important question, "Will it pay?" The answer to this question is particularly important in the South, where about 93 percent of the commercial forest land and 95 percent of the saw-timber volume is presently in private ownership. Station studies in the shortleaf-loblolly pine region have developed information that (1) logging of trees below certain sizes not only does not pay, but also materially curtails the growth rate of the forest; (2) selective cutting under both virgin and second-growth forest conditions usually is feasible; (3) cuts as light as 500 board feet per acre often are possible, particularly where truck logging is used; (4) tractor logging can be used profitably under certain conditions; (5) top logs often can be utilized more profitably for pulpwood than for sawlogs; (6) thinnings and stand improvement cuttings often can be made at an immediate profit, as well as to the advantage of future quality and quantity growth.

The forest survey of the South, begun in 1930, includes an inventory of the present supplies of standing timber and other forest products, an estimate of the current growth rate, mortality rate, and industrial drain, and a study of future forest-products requirements. It is supplying basic information of essential importance in the formulation of sound regional policies for effective and rational use of forest land. Field work has been largely completed and the computation and interpretation of the field data and publication of the results are progressing steadily. Reports on the forest situation by survey units have been issued for nearly every section of the Station territory, and State and regional reports are being prepared.

Among the outstanding survey findings have been that the sound-tree growing stock of usable timber in the Lower South totals about 255 billion board feet, lumber tally (56 percent pine, 44 percent hardwoods and cypress), or 1.1 billion

rough cords (48 percent pine, 52 percent hardwoods and cypress). In 1936, growth was 16.3 billion board feet of saw timber, or 62.1 million cords for the entire growing stock; whereas drain, including mortality, was 17.3 billion board feet of saw timber, or 55.6 million cords total. In 1937, comparable data showed a growth of 16.4 billion board feet of saw timber, or 62.9 million cords total, with a saw-timber drain of 17.9 billion board feet, and a total drain of 57.2 million cords.

The causes for nonpayment of taxes and the uses of land thereby forfeited to public ownership are also under investigation. Land so forfeited in 8 southern states totaled approximately 31 million acres in 1934, of which about 17 million acres was forest land, mostly in poor growing condition. This extensive delinquency is largely the result of (1) abandonment following removal of timber values, (2) inefficient administration of the tax system, and (3) inequitable taxes. Remedies lie in improving the opportunities for private forestry by adoption of more conservative cutting practices, improving the administration of tax laws, and in some cases revising the laws. For lands where private forestry is not feasible, some form of public ownership and administration is the obvious solution.

Recently the Station initiated another economic study, to ascertain and measure the factors influencing the adoption of sustained-yield forestry by wood-using industries. This study should reveal the physical and financial set-up most likely to succeed in the profitable employment of land, capital, and labor for sustained forest management and contrast it with set-ups that seems to work against these objectives. Out of this project should come a better understanding of the growing-stock requirements, the financial structure, the optimum size of utilization plant, and the type and extent of land ownership best suited to each of the principal forest sections in the South.

In the foregoing, I have discussed only those lines of research under way at the Southern Forest Experiment Station which are of major interest to southern lumbermen. I have barely touched upon several other research problems to which the Station is giving attention, such as naval stores investigations, studies of the relation of forests to streamflow and erosion, and flood control surveys. A summary of Station progress is issued currently in our annual report and in various occasional papers, releases, and notes. We are anxious to make these available to anyone interested in them, but present policy dictates that they be distributed only upon request.

In conclusion, I should like to suggest that you lumbermen avail yourselves more fully than you have in the past of the results of the Station's findings. Although we are not an extension agency, we are always glad to answer all reasonable requests for advice and assistance. Our experimental forests serve as demonstration centers, and you are cordially invited to visit them at any time. Many of you have already availed yourselves of this opportunity, and I trust have profited thereby.

We feel that research has already helped point the way toward better and more profitable forestry practice on private lands in the South, but we want to do much more than point the way. We want to orient our program so as to help you directly in your more complex and pressing technical forestry problems, to the very limit of such resources as we have available. We want not only to help solve the technical phases of such problems, but also to make our findings



available for wide and effective application. To do all this we must have your help, in the form of constant contact and stimulation, of constructive criticism and suggestion, of moral support during the progress of our work, and of applying research findings in woods practices. We want you to feel that this is your Station, and that your problems and ours are mutual. With a combined attack on these problems, forestry in the South should make more rapid strides than it has heretofore, to the social and economic betterment of the region.

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